

Co-Becoming with Diatoms: Between Posthuman Mourning and Wonder in Algae Research

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Abstract

The article is an autophenomenographic-poetic, eco-critical meditation on diatoms. It combines a reflection on the role of this algae species in the author's posthuman modes of mourning her passed away lesbian life partner, with a discussion of philosopher Isabelle Stengers's notion of wonder in materialist science, defined as open-ended approaches to unexpected diversity. Diatoms are single-celled aquatic algae, a kind of phytoplankton, which, due to their ability to photosynthesize, have been categorized as plantlike. However, in 2011, it was discovered that diatoms have an animal-like urea cycle, assumed to provide robustness in times of nutrient scarcity, but also making diatoms resist categorizations as either plant- or animal-like. Taking the author's entangled commitments to human–diatom relations and this unexpected discovery as entrance point to reflect on wonder in technoscience, the article discusses ways of shifting from instrumentalizing to wonder-based algae research, asking if speculative art and poetry can open new horizons, interpellating pathways to ethically care about diatoms. The article introduces two poems, articulating the author's relations to the diatoms of Limfjorden, the Danish fjord, where her partner's ashes are spread. The author's autophenomenographic-poetic work is also brought in conversation with feminist technoscience scholar Astrid Schrader's critical research on utilitarian instrumentalism in current harmful algal blooms (HABs) research.

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Introduction

Diatoms are single-celled aquatic algae belonging to the species of phytoplankton, which, like terrestrial plants, contains chlorophyll, transforms light to chemical energy through photosynthesis, and produces oxygen. Living diatoms are reported annually to generate about 20% of the planet's oxygen (Allen et al., 2011). In 2011 an international research team discovered that diatoms, earlier considered plantlike due to their ability to photosynthesize, also have an urea cycle, which makes them able to excrete nitrogen and metabolize in ways that were assumed to characterize only animals and animal-like creatures (Allen et al., 2011). The discovery, reported in *Nature* (Allen et al., 2011), was considered very surprising, since the plantlike ability to photosynthesize and the animal-like existence of an urea cycle until then had been seen as mutually excluding. In terms of the history of evolution, diatoms are older than terrestrial plants and animals. In evolutionary terms the in-betweenness of diatoms is assumed to have made them more robust and fit for overcoming problems such as nutrient starvation (Allen et al., 2011). Still, the way in which their metabolic system(s) makes them resist well-established dichotomous schemes and cross boundaries between categorizations as either plantlike or animal-like creatures was considered a remarkable and unexpected finding. The discovery fits what philosopher Isabelle Stengers (2011, p. 374) pinpoints as wonder-based science—that is, science that takes its point of departure in a material practice that is always open to let go of predefined conceptual frameworks (such as the dichotomous plant/animal distinction), when confronted with matter's diversity. Stengers argues for the necessity of wonder in science, based on the ontological assumption that matter's diversity and dynamism will always exceed science's conceptual frameworks. She also articulates the worry that science under current neoliberal conditions is becoming more and more instrumentalized, leaving wonder aside.

In this article, I shall take further Stengers's (2011) reflections on wonder as an open-ended materialist scientific approach to unexpected diversity—with a particular focus on human–diatom relations and potential agencies of poetic approaches. First, I shall present my commitment to diatoms, which links ecological concerns and deeply personal engagements, related to my mourning of my passed away lesbian life partner, whose ashes are spread in a seabed made up of fossilized diatoms. I use an autophenomenographic and poetic methodology (Allen-Collinson, 2010; Lykke, 2018), which implies that poetic explorations of autobiographic material is a key focus; along these lines, the second part of the article consists of two poems from my forthcoming book (Lykke, 2019b),

poetically articulating human–diatom relations. Third, I discuss a potential shift from instrumentalizing to wonder-based algae research with a starting point in feminist technoscience scholar Astrid Schrader’s critical research on algae (Schrader, 2012, 2015). Fourth, I bring my poetic and autophenomenographic work to bear on the discussion of potential shifts in scientific approaches to algae, asking if speculative poeticizing, posthuman mourning, and spiritual-materialist, feminist, and immanence philosophical approaches to human–diatom relations can contribute to an opening of new horizons and a rethinking of human–algae relations, necessary for such a shift. In conclusion, I sum up what a science of wonder might implicate, building on Stengers (2011), but taking further cues from my dialogue with Schrader’s work (2012, 2015) and from my poetic and autophenomenographic work into account.

Wondering with Diatoms

My personal commitment to diatoms stems from their posthumous co-creation of the so-called Fur Formation, a cliff and earth formation at the coast of the island Fur, located in a fjord, Limfjorden, in the northern part of my home country, Denmark. The ashes of my lesbian life partner are spread over the diatomite seabed outside of the Fur Cliffs. Diatoms are assumed to have first occurred in the Jurassic period 150 million years ago. But the fossilized diatoms of the Fur Formation are, geologically, dated back to the threshold between the Paleocene and the Eocene, 55 million years ago, when the area was covered by a subtropical sea. Mixed with clay, the dead diatoms turned into sedimentary rock (remarkably lighter than stony rock), and the clayey diatomite gathered on the ocean floor. Due to strong volcanic activity at the time, the clayey diatomite also became mixed with layers of volcanic ashes (Pedersen, 2008), and with fossilized remains of animals and plants living in the waters of the subtropical sea. In the Ice Age, around 10,000 years ago, the ice pushed part of the sedimentary rocklike material so that it rose to cliffs of which the highest parts are forty meters above sea level (Pedersen, 2008). Before my beloved died, she and I decided that both our ashes should be spread in these waters. When, as part of my mourning, I have poetically contemplated and philosophically investigated my partner’s metamorphoses from alive to dead human body, transformed to ashes via cremation, and mixed with diatomite sand in the seabed outside of the Fur Cliffs, I have become corporeffectively committed to the diatoms, to the Fur Formation, and to the underwater world, which makes up my beloved’s current whereabouts—a world rich also in living diatoms. A process of co-becoming with my beloved in her present physical state of existence, and reflecting on it through poetic writing and immanence philosophy (Deleuze & Guattari, 1988; Braidotti, 2006, 2013; Bennett,

2010), is part of my spiritual-materialist (Anzaldúa, 2015) endeavor to reconnect. My commitment to the Fur Formation, the underwater world and the dead and living diatoms is, thus, personal but also ethico-political in a multilayered, embodied, felt, and imagined sense. To contextualize my ensuing reflections and the article's suggestions for a wonder-based approach to algae research, let me briefly elaborate on these entangled layers of commitment.

Contemplating the metamorphoses of my partner's material remains and the underwater world, of which her ashes are now part, I came to consider the need for re-ontologizing death and afterlife along the lines of immanence philosophy. Despite differences, major Western—Christian as well as secular scientific—discourses and imaginaries of death share a dualist and dichotomous understanding of life/death, related to the divides running between mind/matter, human/nonhuman, and animate/inanimate. When contemplating my dead beloved's bodily metamorphoses and her becoming one with the Fur Formation, I could not but see the normative effects of these dichotomies as deeply insulting both to my beloved's material remains and to the diatom-rich waters of the fjord. Emerging from a belief in human exceptionalism, and its corollary contempt for the flesh and instrumental approach to worldly matter, the dichotomies reduce the dead human body to either a launching pad for the immortal soul or to a piece of scrap, left behind by the driver, and imply an indifference vis-à-vis the vibrant materiality and physicality of matter—from corpse to diatomous sand. So against the background of my desire to resist this contempt and arrogant degrading, I started a process of philosophically re-ontologizing and poetically reimagining death on posthuman grounds.

As part of establishing a posthuman platform for mourning my partner, I also became much more intensely and specifically committed to an eco-political critique of the ways in which Limfjorden, including the waters outside of Fur, have become an arena for human-induced dying and deterioration, than I had been earlier. The fjord started to hit the headlines as an arena for ecological disasters in the 1970s, after a chemical factory located in the westernmost part of the fjord had discharged enormous amounts of poisonous waste, leading to reoccurring episodes of mass death of fish (Skriver, 2006). Other serious ecological threats to the fjord's ecosystems have been reported as caused by the fishing industry (overfishing), but in particular, the discharge of nitrogen and phosphates from the intensive agriculture in areas around the fjord has been pinpointed as causing so-called harmful algal blooms (HABs)—that is, regularly occurring excessive growth of algae, dominated especially by diatoms and dinoflagellates, and disastrous levels of oxygen depletion during hot summer periods (Skriver, 2006; Carstensen,

Henriksen, & Heiskanen, 2007). While the geology of the Fur Formation is described as overall unchanged since the dramatic events in the Ice Age (Pedersen, 2008), it is commonly noted that the biology of Limfjorden's underwater world, including the waters of the Fur Formation, has been undergoing drastic changes over the last fifty to sixty years (Skriver, 2006). Several species of fish, dependent on living close to the bottom, such as eels and flounders, have more or less disappeared from the fjord (Skriver, 2006). The same applies to a seaweed species, eelgrass, formerly found all over the fjord (Skriver, 2006). Political endeavors to stop the polluting activities have had some effect (Carstensen, Henriksen, & Heiskanen, 2007), but the powerful political position of Danish agro-businesses has made it difficult to reach agreements on serious reduction of the nutrient discharge (Skriver, 2006), leading to recurring incidents of algal blooms and further oxygen depletion (Carstensen, Henriksen, & Heiskanen, 2007).

Long committed to intersections of left-wing, feminist, and green politics, I have, for years, been concerned about the pollution of Limfjorden, and the capitalist "necropowers"¹ responsible for it. However, my commitment to the fjord and the Fur Formation as a space for spiritual-material reconnection has made me politically and ethically attentive to its ecologies and the "necropolitical" (Mbembe, 2003) entanglements that run between death, dying, and politics in new ways. The relationship linking me to the diatoms and the Fur Formation has become a bodily bond—an embodied compassionate companionship (Lykke, 2018)—that I have come to see as part of a planetwide kinship of vulnerable and conative, human and nonhuman bodies (Spinoza, 1996; Haraway, 2016; Lykke, 2019a). This embodied bond has made palpable my desires to engage in critical-affirmative work for change, based on a material neovitalist ethics of sustainability (Braidotti, 2006, pp. 265-266) and a speculative ethics of material care (Puig de la Bellacasa, 2017).

This article is part of a comprehensive project on death, dying, and mourning (Lykke, 2019b) which emerges from a deeply personal experience of loss. But, through a spiritual-material practice of reconnection with my passed away beloved's bodily remains in their present state as ashes mixed with diatomous sand, the project also becomes interlinked with broader political and ecological concerns and the search for ways to resist and transgress the capitalist postcolonial necropolitics of the Anthropocene, causing human as well as nonhuman immiseration, death, and dying. Just like diatoms produce wonder by troubling known scientific and ontological boundaries, so I explore my position as mourning "I," wondering about ways critically and affirmatively to trespass the

life/death dichotomies from feminist, queer, environmentally-concerned, posthumanist perspectives.

A key methodology in my overall project, which also plays a part in this article, is autophenomenography (Allen-Collinson, 2010)—that is, autoethnography with a phenomenological approach. I have developed this methodology further to include poetry writing as a method of inquiry (Richardson, 2000; Lykke, 2014, 2018). Moreover, I use the methodology in resonance with an unfolding of a posthuman and trans-corporeally grounded phenomenology of the mourning “I,” who tries, in poetically speculative and spiritually material modes, to relate to and co-become with the dead beloved in her present mode of existence as ashes mixed with diatomous sand. Within the limits of this article, I cannot elaborate the philosophical aspects of this approach further. However, I shall briefly note that, in line with feminist scholar Astrida Neimanis (2017, p. 23), I reject the claim that posthuman thought and phenomenology should sit uneasily together. I follow Neimanis, who argues that the body phenomenology of philosopher Maurice Merleau-Ponty (2003) is always already posthuman in the sense that the bodily situation and lived experience not only concerns the “subjectivized human level” but also the body’s materiality and trans-corporeal (Alaimo, 2008) relationship with the more-than-human-world (Neimanis, 2017, p. 24). This relationship is crucial for Neimanis when she accounts for the ways in which “we” (humans and nonhumans) experience ourselves as “bodies of water.” But it is also centrally important for the mourning “I” in my autophenomenographical research, because the poetic and spiritual-material pursuit of ways to co-become with the dead loved one implies a transgression of conventional modern, Western ways of mourning, which stay within the limits of either a posthumous remembering of the human subject, or the religious frameworks built on a mind/body dualism.

In this article, I shall focus on two poems from my collection, “Fur” and “Algae Chant” (Lykke, 2019b). Concerned with the question of my co-becoming with diatoms, diatomous sand, the Fur Formation, and its underwater world, these poems spell out the entanglement of poetic, spiritual-material, and eco-political commitments, which are at the core of my posthuman autophenomenographical work.

Two Poems

Fur

1

We never walked along the coasts of Limfjorden together.
No memories of shared life can be found here.
In our home in Odense, you are everywhere.
Your jackets in the closet.
Your shoes in the entrance hall.
Your computer, your desk,
your big armchair in the living room.
Your books on the bookshelf.
Your bed next to mine, upstairs.
In the back yard, the shell pattern of differently coloured
cobblestones,
which we designed together.
But here at Limfjorden, everything is new.
Last year, I slept here with your blue urn next to me in bed,
as I listened to the waves of the Fjord,
gently breaking on the beach outside.
The next day we sailed to a quiet place
beyond the cliffs of the island of Fur,
and watched your urn disappear beneath those waves.
You are here!
You are real—
as a body of ashes.
The sunset light is broken by dark clouds.
A fine drizzle on my bent back,
as I caress the wet beach stones.
Waves move gently over my hand.
Seaweed winds around my fingers.
You are in the rain—you are in the waves.
I am coming—my love.

2

One more year has elapsed.
I have eloped to the Fjord one more time.
I am searching for you.
Can I find you again?
Is a rendezvous repeatable?
As I approach the Fjord,
heavy rain is pouring from a pitch-black sky.
But over the island of Fur
a white cloud is emerging

in the midst of the dark-grey cover.
Before I reach the hotel,
the rain has stopped,
and the evening sun is hovering low over the Fjord.
The sky has cleared completely now.
It is very hot,
as it was two years ago when we released your blue urn into the water.
Suddenly, a light drizzle is cooling my skin—
the air is filled with raindrops pierced by sunlight,
like falling prisms.
It keeps dripping, endlessly.
How long can it rain from a cloudless sky?
I feel like swimming.
The water folds smoothly around my body.
I am floating on my back
looking up into the sky.
You hold me,
while I swim with long, long back strokes.
I fill my backpack with oyster shells.
The beach abounds with them.
Many are fused
into double, and sometimes triple shells,
inseparable
now in death,
as they were before,
when inhabited by live oysters.
Then my gaze is drawn
by the blue, red, yellow, black, white stones of the cliff.
A gigantic abstract painting,
created by enormous dynamic forces,
fossil on fossil,
55 million years of vibrating geological history
condensed into a forty-metre high cliff
erase every meaningful distinction
between life and death.
I walk along the beach under the cliff.
I visit caves, carved out by waves,
caress the gigantic crevices
that crisscross the walls.
A spring gushes from the cliff,
its intense murmur catches my ear,
the water running over my hands.
I climb the steep slopes,
cling to bushes of heather and leaves of grass,
creep through impassably entangling pine branches,
and with cuts on arms and legs,

I finally reach a path
which takes me
through forest and heathland
to the summit of the cliff.
I sit in the grass for a long, long time,
contemplating the waters of the Fjord.
There, precisely there, in the direction of the three windmills,
we let go of the line to the fishing net
with your blue urn resting on a bed of oyster shells and beach stones,
our last tie to who you were before.
There, precisely there, two years ago,
your blue urn was swallowed by the waters of the Fjord.
Uffe has told me
about a special kind of Buddhist body meditation
which requires you to imagine yourself as dead.
I try to imagine my dead body,
and the fire that will transform it to ashes.
There, precisely there,
we will meet again—
ashes to ashes.
I am coming—my love.

Algae Chant

1
Living algae
in the waters,
soft and hairy,
like a cat's fur.
Oh, I love you,
Algae.
My desire
is to pat you,
and to co-become with you.
Algae, Algae,
wise old critter,
can you teach me
how to photosynthesize?
Be a creature
in-between?
Peeing
as an animal;
growing
branches, leaves, and fruits?

2

Eating oysters
spiced with algae,
salty fluids
in my mouth.
Cool, clear water,
darkish night sky,
mango moon,
and algae juice.
Algae juice
on sticky fingers,
swimming naked in the sea,
splashing, splashing,
fur-ish algae
touching bodies;
seaweed strokes
caress our skin.
Kisses growing even deeper,
swimming, swimming,
farer, farer,
from the shore.
You are leading,
mango moonlight,
touch my
shiny algae fur.

3

Swimming, swimming,
water cooling,
naked bodies
getting colder
and more stiff.
Having trouble
with my breathing.
Gasping, gasping,
scary depths.
Dizzy, dizzy,
undercurrents,
where to go?
Dizzy, dizzy,
water, water,
all around me,
dizzy, dizzy,
in the waves.
Cannot see you!

Gone, gone!
Mango moon ray,
take me with you,
take me with you,
do not leave me,
pierce my heart,
my mango moon ray,
make me sink,
until the blackness
swallows you
as well as me.
Merging
with the waterworld,
and staying there forever.

4

Brownish water,
dying algae,
children screaming
"Oooch, it is poison!"
Dying in a hell of sulphur,
sulphur death
in white surroundings.
Innocence:
"It was not me!
No, I did not
cause this dying,
me, a white
and guiltless farmer,
who just wants to do my best!
Could I ever do such harm?
For the oxygen depletion,
algae are the ones to blame!"

5

"Farmer, farmer,
stop this nonsense!
You are overfeeding us!
Give us pleasure!
Do not gorge us!
Use your brains,
and be attentive!
Try to watch us,
and attune!

We are old
and very wise!
We can teach you
many lessons
about kinship,
time,
and
sympoiesis,
if you listen
carefully!
Otherwise,
just go
to hell,
just go to hell
—and die!”

Harmful/Useful to Whom?

To help me invoke possible answers to the question if and how posthuman mourning and spiritual-materialist, feminist approaches to human–algae relations can contribute to an affirmative ecological critique and potential new pathways for scientific research on human–algae relations, I juxtapose my poems with Schrader’s (2012) critical studies of mainstream discourses, imaginaries, and scientific practices related to prevention of HABs. In the end of the discussion, I also enter into dialogue with Schrader’s (2015) study on how to “begin to care” about deformed leaf bugs.

Schrader’s (2012) radically posthuman analysis of HABs research examines the ways in which anthropocentric utilitarianism blocks the unfolding of algae research, which takes seriously that these creatures are “lively things” with their “own points of view” (Schrader, 2012, p. 76). Schrader’s critical discussion of HABs research is related to the Gulf of Mexico. But, due to resonances between human-induced HABs there and in Limfjorden, and between discourses, imaginaries, and scientific practices related to HABs in these two underwater environments, Schrader’s reflections are applicable in my context, too. Therefore, I try to diffract her plea for an ethico-onto-epistemology,² which recognizes the algae viewpoint and liveliness, with my spiritualist-materialist and poetical-philosophical endeavors to establish a platform for posthuman mourning of my passed away life partner.

Posing the question “harmful to whom?,” Schrader spells out the anthropocentrism of HABs research, emphasizing how the term *harmful algal blooms* constructs the algae as the enemy, while casting smoke screens around

the key part played by capitalist agro-businesses, whose profits are given political priority. Adding to Schrader's argument, I shall put more emphasis on the fact that utilitarian anthropocentric algae research is not only claiming a "negative" algae agency, critically pinpointed by Schrader's polemic question "harmful to whom?," but also a "positive one." Algae do not only appear to mainstream science as "harmful" agents, taking part in the destruction of fishing industries through their excessive "blooms." There are also industrial and commercial expectations to algae. Diatoms have, for example, become players in the development of nanotechnologies, where their ability to manufacture nanoscale structures is assumed to be exploitable (Tesson & Hildebrand, 2010). Thus, it seems pertinent to complement Schrader's polemic "harmful-to-whom?" with the question of "useful-to-whom?" in order to emphasize that anthropocentrism instrumentalizes research on algae, regardless of whether it casts them in negative or positive roles.

Schrader (2012) also carves out the anthropocentric implications of the ways in which the consequences of HABs are discursively represented as a step "down" the evolutionary ladder, "backwards" to the "time of slime". She paraphrases an article from Part One "A Primeval Tide of Toxins" of the Pulitzer Prize-winning series "Altered Oceans" by *Los Angeles Times'* journalist Kenneth Weiss (2006)³ characterizing "the current ecological transformation of the oceans as the 'rise of slime'" (Schrader, 2012, pp. 76-77). According to Schrader, "slime" here refers to "to the sliminess of some of the organisms that thrive under conditions of oxygen depletion" (2012, p. 78), but the term is also associated with something that is morally disgusting. Schrader pinpoints how marine ecologist and paleontologist Jeremy Jackson, whose research is referenced in the *Los Angeles Times* series, links slime and disease, while also giving a blatantly anthropocentric account of the ways in which HABs are connected to killing of "higher" organisms such as fish and corals, which Jackson, by contrast to the "slime," characterizes as "the kind of life 'we' want" (Jackson quoted in Schrader, 2012, p. 78).

Another key point in Schrader's critique is to underline how anthropocentrism informs the onto-epistemologies governing environmental research on HABs, and how linear progress narratives severely limit the perspectives of this research. She critically pinpoints how HABs research is based on an unproblematized conceptualization of time as a container, which moves mechanically "forward" along a line, while contrasting essentialized and statically naturalized algae dichotomously to cultural—lively and flexible—humans, who use their "exceptional" agency to move teleologically towards "the future." Schrader argues for the necessity of disrupting the ways in which the dichotomy, dynamic

humans/culture versus static nonhumans/nature, is built into mainstream Western conceptualizations of the linear time of evolution. She also emphasizes that such a disruption “requires attention to how we get to know nonhuman others” (Schrader, 2012, p. 76). According to Schrader, scientific investigations should consider that the objects to be studied have their own differently (spatially, temporally, and trans-corporeally) situated agencies and “points of view” (2012, p. 76). For algae research, an alternative approach would, as Schrader suggests, imply considering how algae in one time, location, and trans-corporeal relationality may act in other ways than algae differently situated. Moreover, Schrader spells out how “we” (humans) must take such situated spatiotemporal differences carefully into account, if “we” want to know algae, not only to control them but to get to know them as planetary kin (Haraway, 2016; Lykke, 2019a) and to learn from them in order to sympoietically⁴ co-evolve.

Between Speculative Poeticizing and Wonder-Based Research

I shall now evoke Stengers’s (2011) definition of a science of wonder, and note that Schrader’s call for alternative approaches to science that recognize algae liveliness and perspectives resonates with Stengers’s concept. Moreover, I also bring the autophenomenographic and poetic exploration of my spiritual-materialist practices of posthuman mourning and co-becoming with Limfjorden’s diatoms into the discussion. I shall discuss how spiritual-materialist and poeticizing approaches such as the ones that I have developed as part of my posthuman efforts to co-become as mourning “I” could be important not only for the re-ontologizing of death in an immanence philosophical sense, which has been key to my mourning. These approaches can, I suggest, also be important for rethinking and reimagining the algae-other in a context of wonder (Stengers, 2011), which speculatively may open new horizons for the understanding of algae–human relations beyond instrumentalizing, narrowly utilitarian onto-epistemologies.

Before going deeper into the question about the potential contributions of my poems to the discussion of wonder in algae research, I shall make a small detour to the issue of speculative fabulation/poeticization in feminism, as a possible pathway to the opening of new horizons for thinking, feeling, imagining, and acting differently. When referring to speculation, I am indebted to Donna Haraway and other feminists dedicated to writing and theorizing feminist science fiction, who, for years—long before what recently has been named a “speculative turn” in philosophy (Bryant, Srnicek, & Harman, 2011)—have been committed to

the potentials of speculative storytelling and fabulation. Haraway explicitly engages in speculative storytelling and fabulation in her recent book on kin-making in the Cthulucene (Haraway, 2016). However, speculative fabulation is definitely not a new theme in Haraway's work. Since *Primate Visions* (1989), she has again and again returned to feminist science fiction as a space for speculating realistically—that is, for inventing-thinking-imagining-feeling elsewheres and otherworlds, which are not just wild imaginations, but arenas for in-depth exploring the question: how could this world be? Feminist philosopher Maria Puig de la Bellacasa (2017), who made a major contribution to “speculative ethics,” links this “could-be” explicitly to an epistemology of ethico-political standpoint formation, through which one not only seeks knowledge about the world but also, in so doing, caringly adds something “in order to make a difference” (2017, p. 59). Puig de la Bellacasa specifies that “this involves not only detecting what is there, given in a thing-gathering, but also to think what is not..., [but] what could be” (2017, p. 59). It is to be noted that both Haraway and Puig de la Bellacasa are in conversation with Stengers and her notion of wonder in science. Wonder, speculation, fabulation, and caring are interlinked in these approaches.

To sustain the claim that my speculatively fabulating poeticizations could contribute to a rethinking and reimagining the algae-other beyond anthropocentric scientific discourses on harmfulness/usefulness, I suggest that my poetic texts may encourage wonder through their attending to positions of enunciation, disrupting the human “I” as the self-evident carrier of the textual point of view. What may give rise to wonder here is the ways in which this disruption profoundly challenges the anthropocentric onto-epistemology that, according to Schrader, governs algae research, while preventing algae viewpoints from being articulated. To spell out what it means to foreclose algae perspectives, I ask if the algae can “speak,” and with reference to Schrader's analysis, I claim that the answer is, “No, not as long as ‘we’ (humans) stay within an onto-epistemological anthropocentrism!” However, when my poem “Algae Chant” blurs the boundaries between human “I” and algae “you,” and ends up locating the position of enunciation with the algae, while the human “I” vanishes, this can be read as a gesture of speculative disruption of the onto-epistemological silencing of the algae, and an exploration of what it implies to create a position of enunciation for algae perspectives. I suggest that new horizons open for poetic speculation with the potential aesthetic-ethical effect of evoking wonder. Moreover, I claim that efforts to call forward this kind of effect could be a good foundation for embedding scientific practices in the “power of wonder,” which, according to Stengers (2011, p. 374) means entering into the event which the scientific encounter with matter should always be framed as, in an open-minded

state, which allows total surprise and the completely unexpected to flourish. Whether I poetically succeed in creating wonder along these lines is for readers to judge. But what I learnt myself from the poetic experiment, which shifts the position of enunciation, is that it creates new and very different ethical attachments and aesthetic sensibilities. It fosters an experience of a corpo-affective kinship between human and algae (Haraway, 2016; Lykke, 2019a), affirmed through a commitment to an ethics of sustainability (Braidotti, 2006, pp. 265-266) and caring in the speculative mode of the “could-be” (Puig de la Bellacasa, 2017, p. 59).

My poetic explorations of multiply intertwined life/death temporalities of diatoms and humans in the poem “Fur” may also create wonder. They may do this while raising open-ended questions about the relations between these very different timescales and perspectives on life/death, and while starting also to question the predetermined, evolutionary progress narrative of a development from “simple” diatoms to “complex” humans within an essentialized, “neutral” time container, critically pinpointed by Schrader. Pushing the speculative poeticization further, “we” (humans) may start asking if we can learn from the diatoms that have been on Earth since the Jurassic era, as chrononormative science tells us through discourses that fetishize linear movement along the line of time’s arrow, anthropocentrically modeled on historical time of Western modernity. We may perhaps even turn the argument about chrononormative linear development from “simplicity” to “complexity” upside down in a queering mode. Instead of thinking of diatoms as a simplistic version of “later,” “higher” life forms, such as humans, animals “proper,” and terrestrial plants, we could perhaps instead start from the assumption that diatoms, due to their existence through eons, have evolved excellence in performing a cyclical and sustainable art of living and dying on this planet, rather than a linear and teleological one. Along these lines, we could maybe begin to approach diatoms as potential carriers of an ancestral insight, from which we may learn new lessons, if we attune to listen attentively, and become prepared for unpredictable wonder. Twisting the question that animal studies scholar and philosopher Vinciane Despret (2016) poses as main title of her book “What would animals say if we asked the right questions?,” substituting “animals” with “diatoms,” we could ask, what would diatoms say if we asked the right questions?

The climate crisis and other kinds of planetary-scale human-induced, “multispecies, including human immiseration, across the expanse of Terra” (Haraway, 2016, p. 46) currently debated under the label of the “Anthropocene,” testify to the fact that “humanity” (modern white Western hu/man) (Osamu,

2006) has done pretty badly when it comes to learning “the art of living” (Tsing, Swanson, Gan, & Bubandt, 2017)—and dying—in a balanced and sustainable way. Diatoms seem to have done much better. According to geological analyses of the waterworld in which Fur’s clayey diatomite is immersed, the subtropical sea, which, in-between the Paleocene and the Eocene 55 millions years ago, covered the fjord area in this part of Denmark, indeed seems to have been a “high-stress environment” back then (Pedersen, 1981, p. 496). The “stress” was created by periods of intense oxygen depletion and release of poisonous hydrogen sulphide generated by decaying organisms, including abundantly flourishing diatoms. But even though the events of these ancient times, including the agencies of diatoms, seem to have been dramatic and occasionally destructive, they did not threaten life on a planetary scale as does current human activity. Therefore, contemplating intertwined human–diatom timescales and dramas on the thresholds of life/death in this relational way could perhaps give rise to wonder-based diatom research framed as lessons in resilience along the lines of Haraway’s (2016) juxtaposition of resilience as *both* “refusal to deny irreversible destruction” *and* to “refusal to disengage from living and dying well in present and futures” (p. 86). It seems as if diatoms have cultivated these twin refusals to perfection throughout their eonic existence—on the one hand, staying with irreversible trouble (such as anoxic events), while, on the other, struggling to live and die well now and in futures to come. So, I shall suggest that lessons in balancing between both these refusals can perhaps be learnt from listening to diatom stories in a mode of scientific wondering.

With reference to the contemplations of the mourning “I” in the poem “Fur,” I shall, in particular, emphasize how such diatom stories may guide us (humans) towards what I shall define as the aionic time of mourning—that is, a time defined by “the continuous tense of becoming” (Braidotti, 2013, p. 129). The excessive mourner, the one who transgresses the time limits of mourning stipulated by biopolitical agendas of current neoliberal health normativity regimes (Freud, 1917/1946; APA, 2017) does not care about chrononormative and teleological time. The mourning “I” desires to rest “in sadness without insisting that it be transformed or reconceived” (Cvetkovich, 2012, p. 14). In terms of time, this means dwelling in a temporality, which, seen from an individual perspective, can be described as a time of no time, but which, brought in conversation with diatom time and immanence philosophy, takes on aionic qualities, defined by “the continuous tense of becoming” (Braidotti, 2013, p. 129). Staying in this kind of time zone may also create wonder.

Finally, I suggest that, when articulating the mourning “I”s bodily desires to co-

become with cliffs, diatomous sand, algae, and underwater world, my poetic texts may create wonder in terms of offering ways to begin to compassionately care about rather than instrumentalize algae. What does this mean? Let me again enter into dialogue with Schrader. How to “begin to care” about “strange” creatures—“others of whose existence we might not even have been previously aware” (Schrader, 2015, p. 667)? Schrader (2015) poses this question in an article on Swiss artist, environmental activist, and science illustrator Cornelia Hesse-Honegger’s artistic-scientific paintings of leaf bugs deformed by low, long-term doses of radiation in the aftermath of Chernobyl. The question is discussed with a focus on philosopher Jacques Derrida’s (2002, 2008) notion of “abyssal intimacy.” Abyssal intimacy refers to an intimacy that, in a corpo-affectively caring mode, crosses the “abyss” between “the human” and “the animal.” According to Derrida (2002, 2008), this “abyss” has been established by massively dominant onto-epistemologies of Western philosophy. According to Schrader (2015), the paintings and Hesse-Honegger’s mode of working aesthetically, ethically, and scientifically, while also using her paintings to articulate an activist protest, encourages viewers to begin to care ethically for the deformed leaf bugs. The gesture of encouraging viewers to begin to care is a complex one. It is consciously not linked to any immediate suggestions as to how to act upon the experience of feeling an urge to care for the leaf bugs. But, according to Schrader (2015), Hesse-Honegger’s paintings do, indeed, encourage viewers to engage in a corpo-affectively caring effort to transgress the human–animal “abyss” and the intersecting divide separating “us” (humans) from insects, for example, which are conventionally perceived as more “alien” and, therefore, even less likely candidates for being recognized as in need of care than so-called “higher” species of animals.

I see some resonance with my poetic writing on algae here, which I shall spell out in order to highlight my final point about how it may open horizons for wonder and wonder-based science. Like Hesse-Honegger, the mourning “I” of my autophenomenographic work is also reaching out to “strange” creatures, crossing the “abyssal” divide of which Derrida (2002, p. 399) speaks. But according to the logic of the “abyss,” diatoms can perhaps be assumed to conventionally appear as even more “alien” than leaf bugs, and, therefore, even further removed from something which “we” (humans) would “begin to care about.” I suggest that the way in which diatoms defy conventional philosophical and scientific categorizations as either plantlike or animal-like creatures is likely to widen the abyss, and make a caring approach even more unimaginable and unthinkable. According to Schrader (2015), who discusses a class of students’ responses to the work of Hesse-Honegger, there is already an enormous abyss when it comes to

imagining an ethically caring attitude vis-à-vis deformed leaf bugs. “I don’t care about bugs!” was the immediate reaction of a majority of Schrader’s students when confronted in class with two texts on the Chernobyl disaster—one on the consequences of human exposure to long-term radiation, and one on Hesse-Honegger’s artistic reaching out to deformed leaf bugs (Schrader, 2015, p. 666). So if “we” cannot care about leaf bugs, how to begin to care about diatoms, even more removed from “the human”—not even being a “proper” animal, and lacking the rootedness of a “proper” terrestrial plant?⁵ My poems are different from Hesse-Honegger’s artwork. But I think that I share with her a desire to transgress the abyss and establish “abyssal intimacy” in poetic/artistic gestures of corpo-affective, compassionate caring and touching. Preparing for the writing of my poems while touching living and dead algae in Limfjorden made me begin to care differently, taking into account that touch is a sense that bridges dichotomies of active/passive and subject/object. This, too, I claim may open new horizons for wonder and wonder-based science.

Conclusion: Science of Wonder and Ethics of Sustainability and Caring

When discussing algae research and potential shifts from utilitarian to wonder-based onto-epistemologies and methodologies, it is to be noted that wonder can be specified in different ways. In conclusion, I shall summarize the specifications, emphasized by Stengers herself, as well as some to be added against the background of this article’s analyses.

According to Stengers, wonder is interconnected with the ability to be “affected, troubled, surprised” (2011, p. 374) by matter’s diversity and, I shall add, vibrancy (Bennett, 2010). This ability resonates with what Haraway (2008) calls response-ability, the ability to respond to the other. As another key feature, Stengers (2011) links the presence of wonder in materialist science to “struggle.” She argues that “just like the Marxist concept of class, materialism [in science] loses its meaning when it is separated from its relation with struggle” (Stengers, 2011, p. 368). I link this statement to Braidotti’s cartography of the politics of affirmatively critical posthumanisms, thriving together with new, proliferating, and intersecting “minority-driven” interdisciplines such as queer, trans, feminist, decolonial, posthuman, anti-racist, postsocialist, environmental, dis/ability “studies” (Braidotti, 2018, p. 21). These are “studies” that generate research committed to struggles for social and environmental justice worldwide, and in so doing make a case for cross-cutting alliances that strive to involve not only humans but also nonhumans, among them algae, as subjects, agents, and activists in this work. To

commit to such alliances must thus also be part of a wonder-based science, building on corpo-affective bonding and unfolding of a planetary kinship (Haraway, 2016; Lykke, 2019a), which humans join from a de-exceptionalized perspective.

In my autophenomenographic-poetic research, I explore the position of a mourning “I” and a phenomenology of posthuman mourning embedded in practices to spiritually-materially reconnect and co-become with the material remains of my dead beloved, which I unfold in tandem with a search for pathways to de-exceptionalize the human. My entrance points to this search are, on the one hand, deeply personal, and in this sense in resonance with my strong wish to avoid normativizing routes to an ethics and aesthetics of posthuman mourning. But, indeed, on the other hand, it cannot be denied that most humans are likely, at some point in their life cycle, to take up the position of a mourning “I.” So I also wonder if posthuman mourning practices perhaps could be collectively cultivated with a humbling effect on subjects, otherwise bent on human sovereignty and control, and maybe pave the way for both new spiritual-materialist ecologies and technoscientific approaches based on wonder.

Generally, it cannot be emphasized enough that wonder, including wonder in science, must be understood as a phenomenon that can neither be controlled nor willed into existence by normative or instrumentalizing procedures. But it is also important to note that technoscience is a messy endeavor, and that utilitarian-instrumental aspects can be mixed with wonder. However, to create conditions for wonder to potentially occur, I suggest that a speculatively fabulating/poeticizing approach is apt for opening horizons and creating new sensibilities that can help the unfolding of an ethics of sustainability and caring, which transgresses the philosophically and scientifically constructed “abyss” between the human and the nonhuman (animal or plant) other, as well as between the human and even “stranger” others such as diatoms.

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Notes

¹ The terms *necropower* and *necropolitics* are borrowed from postcolonial scholar Achille Mbembe (2003), who argues that Michel Foucault’s (2003)

conceptualization of biopolitics should be complemented by a conceptual framework that grasps that modern society is not only pervaded by biopower and endeavors to make citizens live, but also by tendencies to systematically let (some groups of people) die. Using the notions of necropower and necropolitics in the context of the polluting effects of capitalist agriculture on the ecosystems of Limfjorden, I extend the definition to include the systematic inducing of nonhuman death and dying as a consequence of capitalist modernity (Lykke, 2019a).

² The concept of ethico-onto-epistemology used here is based on Karen Barad (2007), who, against the background of her agential realist understanding of the world's intra-activity, theorizes epistemology, ontology, and ethics as inextricably intertwined. The portmanteau term *ethico-onto-epistemology* is meant to signal this intertwinement.

³ The journalistic report is written by environmental reporter Kenneth Weiss, who references marine ecologist and paleontologist Jeremy Jackson, Scripps Institute of Oceanography, University of California, San Diego.

⁴ Along the lines of Haraway, sympoiesis can be defined as a concept that radically takes into account the ways in which all the world's critters are entangled in processes of continuous re-assembling and becoming with one another: "Critters interpenetrate one another, loop around and through one another, eat each other, get indigestion, and partially digest and partially assimilate one another, and thereby establish sympoietic arrangements that are otherwise known as cells, organisms, and ecological assemblages" (Haraway, 2016, p. 59).

⁵ Diatoms are different from terrestrial plants among others because they lack roots. In terms of the discussion of the abyss between "human" and "plant"—which can be added to that between "human" and "animal," which Derrida addresses—it is to be assumed that precisely the "rootedness" of terrestrial plants is one of the features that contributes to a diminishing of the abyss. In so far as the "roots" may contribute to make "us" (humans) see plants as metaphors for home and belonging (Irigaray & Marder, 2016, pp. 117-118). Diatoms are in this sense likely to be seen as "more alien" than terrestrial plants.

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